REMARKS

A Request for Continued Evaluation is concurrently filed herewith.

Claims 1, 2, 7-10, and 13-20 are all of the claims pending in the present Application. Claims 7-9 are withdrawn. Claims 3-6, 11, and 12 are canceled.

It is noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Claims 1, 3-6, and 10-20 stand rejected under 35 USC §103(a) as unpatentable over US Patent 5,541,753 to Raynes et al., further in view of US Patent 6,115,014 to Aoki et al. Claim 2 stands rejected under 35 USC §103(a) as unpatentable over Raynes, further in view of Kuo et al, SID 94 Digest , Vol. XXV, page 927-930.

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

As described and claimed, for example by claim 1, the present invention is directed to a liquid-crystal display including a liquid-crystal layer provided between a pair of substrates so as to be oriented to bend alignment. A phase compensation plate is provided for an outside of each of the substrates and a color filter including a blue color formed on either one of said pair of substrates, a wavelength of a light judged as blue by a person being 380 to 488 nm.

A retardation of the light passing through the liquid-crystal layer and the phase compensation plates is limited to a value ½ or less of a minimum wavelength of the light relating to display, <u>the minimum wavelength of light is set in accordance with the blue color, thereby monotonously decreasing the transmittance of light throughout a transmittance wavelength of the color filter as an applied voltage rises during a predetermined range of driving voltage</u>.

The present invention addresses the problem demonstrated in Figure 10 in which the electrooptical characteristic of the LCD exhibits a transmittance curve of a shortest wavelength color as differing from other colors (e.g., the other two primary colors), thereby

causing the need for different applied-voltage settings, as well as the problems of viewing angle and manufacturing cost.

In contrast, the present invention teaches a method to achieve a wide viewing angle by using OCB mode, wherein the manufacturing cost can be reduced by being able to use a single power supply, based on the retardation of the shortest wavelength color filter (e.g., the blue color filter).

II. THE PRIOR ART REJECTION

Claim 1 has been amended to clearly describe patentable features over the cited references in that a color filter including a blue color is formed on either one of the pair of substrates. A wavelength range of the light judged as blue by a person is 380 to 488 nm. A retardation of the light passing through the liquid-crystal layer and the phase compensation plates is limited to a value ½ or less of a minimum wavelength of the light relating to the display. The minimum wavelength of light is set in accordance with the blue color, thereby monotonously decreasing the transmittance of light throughout the transmittance wavelength of the color filter as an applied voltage rises during a predetermined range of driving voltages.

Claim 10 has been amended to clearly describe patentable features over the cited references in that the shortest wavelength color corresponds to the blue color and falls in a range between 380 nm and 488 nm. A liquid-crystal layer is formed such that, during a predetermined range of driving voltages, a retardation of the light passing through the liquid-crystal layer and phase compensation plates is limited in range between zero and a value of ½ of the shortest color wavelength, thereby monotonously decreasing the transmittance of light throughout the transmittance wavelength of the color filter as an applied voltage rises.

According to these features of the present invention, it is possible to equalize applied-voltage settings for all colors and realize a wide viewing angle when preforming color display by the OCB mode.

In contrast, Raynes et al. (US Patent No. 5,541, 753) is silent to the problem addressed and solved by the present invention. Moreover, Raynes et al. does not teach or suggest that the retardation of the light passing through the liquid-crystal layer and the phase compensation plates is limited to a value of ½ or less of a minimum wavelength of light

relating to the display, the minimum wavelength of light being set in accordance with the blue light.

Therefore, Applicants submit that all remaining claims are patentable over the cited references.

Raynes et al. teaches that a liquid crystal display device includes at least one phase plate, and the combined retardance of the phase plate and a liquid crystal layer is substantially equal to (M+1) $\lambda/2$ at a first operating voltage of the device and is substantially equal to M $\lambda/2$ at a second operating voltage of the device, where M is an integer and λ is a wavelength of optical radiation. Raynes et al. teaches that a high contrast display can be obtained by adjusting the drive circuit so that the off-voltage is set to the first maximum and the on-voltage is set to the first minimum, as shown in Figure 3.

A transmitted-light intensity of a liquid-crystal disply using the birefringent property can be expressed by the equation (1) of the present specification in the case of color display operation. Equation (1) shows that the transmitted-light intensity for each wavelength varies depending on a retardation Δnd of the liquid crystal layer and the phase-compensation-plate. Figure 1 below shows the relationship between the retardation Δnd and the transmitted-light intensity for three primary colors.

Fig.1 Δnd vs Trancemittance

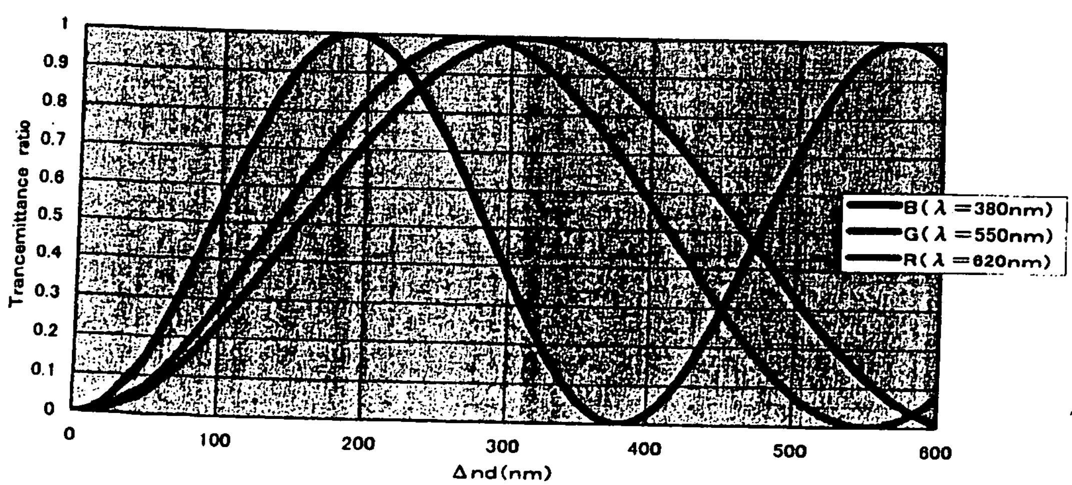
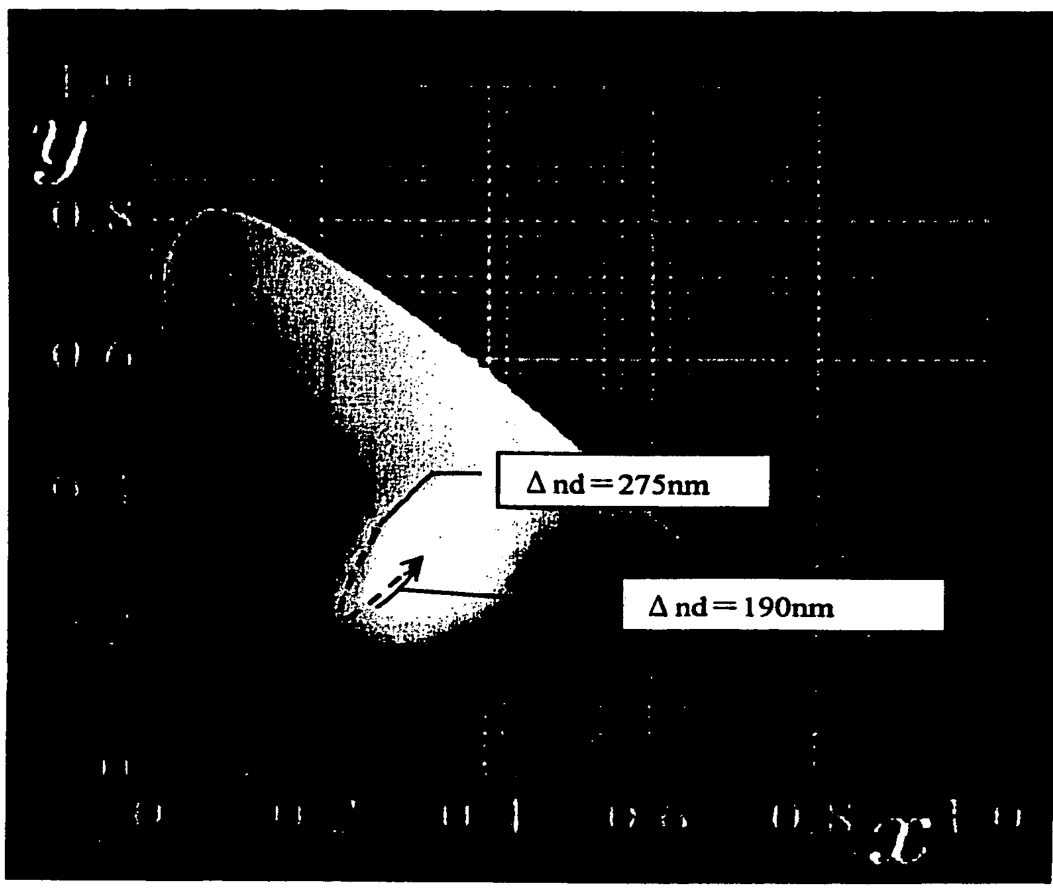


Figure 10 of the present application shows another aspect as rewritten into the relationship between an applied voltage and transmittance of light colors. The retardation decreases as an applied voltage rises since directors of liquid-crystal molecules are changed. When the retardation is equal to zero, black is displayed. Supposing that the retardation is set to 275 nm which is ½ of the green light wavelength 550 nm, rather than ½ of blue light wavelength 380 nm, the transmittance of blue color increases in the range between 275 nm and 190 nm of Δnd, and decreases in the range between 190 nm and 0 nm of Δnd. The transmittance of green and red colors monotonously decreases.

These changes show the orbit demonstrated below on color coordinates. The color changes from green to blue, and finally changes to white. The above-mentioned liquid crystal display characteristic is defective as a commercial product because the liquid crystal display exhibits an unnatural gray-scale.



In contrast, in accordance with the features of the present invention, it is possible to equalize the applied-voltage settings for all colors and realize a wide viewing angle when performing color display by the OCB mode.

Raynes does not mention this problem and is silent that the retardation should be set with reference to any color, in the case of multi-color display operation, even if it does describe that λ is a wavelength of visible light. Referring to the embodiment of Raynes in which the retardation Δnd of the liquid crystal cell is 1.4 μm and the retardation Δnd of the phase plate is 1.4 μm, this value is larger than the retardation of conventional cells described as the prior art in the present application, thereby causing an unnatural gray-scale in the case of multi-color display operation. Raynes only teaches substantially the same technologies as the prior art described in the present application. Raynes does not teach or suggest the above-described features of the present invention.

Amended claims 1 and 10 have patentable features over the cited references in that a color filter with blue color is formed on either one of the pair of substrates, where the wavelength of the light judged by a person as being blue is 380 to 488 nm. The retardation of the light passing through the liquid-crystal layer and the phase compensation plates is limited to a value ½ or less of the minimum wavelength of the light relating to the display. The minimum wavelength of light is set in accordance with the color blue, thereby monotonously decreasing the transmittance of light throughout transmittance wavelength of the color filter as the applied voltage rises during a predetermined range of driving voltages.

Therefore, Applicants submit that amended claims 1 and 10 are patentable over the cited references and that claims dependent from these amended claims are also allowable.

For the reasons stated above, the claimed invention is fully patentable over the cited references.

III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1, 2, 10, and 13-20, all the claims presently being examined in the application, are patentably distinct over the prior art of record and are in condition for allowance, and the withdrawn claims are subject to

allowance by rejoinder. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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